Cerebral circulation during retrogarde cerebral perfusion: evaluation using laser speckle flowgraphy (Commentary)

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In the current issue of *The Annals*, Kanda and colleagues [1] have introduced a novel technique, laser speckle flowgraphy, to measure the microcirculation of the optic nerve head(ONH) during several conditions in aortic arch surgery. Kanda quantitates the blood flow of the ONH at six time points during arch replacement: 1)after induction of anesthesia, 2)after initiation of cardiopulmonary bypass, 3)during simple circulatory arrest(CA), 4)during retrograde cerebral perfusion(RCP), 5)during selective antegrade cerebral perfusion(SACP) and 6)after termination of cardiopulmonary bypass. In summary, there was no difference in optic nerve blood flow between CA and RCP with moderate hypothermia. The blood flow of the ONH was significantly higher during SACP compared to CA and RCP. They conclude that RCP with moderate hypothermia may not be adequate to provide cerebral blood flow compared to SACP [1].

As in all things, the devil is in the details. Moderate hypothermic circulatory arrest(MHCA) was instituted at a rectal temperature of 26 to 28°C. After a brief period of CA, a brief period of RCP was begun at 100-300 mL/min to maintain cerebral venous pressure of 20 mmHg until SACP was started. SACP was instituted at a flow rate of 10 mL/kg/min maintaining a right radial arterial pressure of 45 to 60 mmHg. This technique utilized by Kanda is complex and elegant. It minimizes the period of CA, removes air and particulate matter from the arch vessels during RCP and provides quantifiable blood flow to the brain during SACP. This study provides very good evidence that *a brief period of RCP at 20 mmHg* does not provide optic nerve blood flow at MHCA.

This conclusion, while valid, introduces an acknowledged technical limitation of this study: the brief use of RCP at 20 mmHg, which may not be enough time or pressure to see optic nerve blood flow. The authors used 20 mmHg in order to avoid cerebral edema however, others have used RCP at 25 mmHg or higher to achieve clinical brain perfusion [2]. Therefore, this study cannot definitively answer if RCP alone is sufficient for hemiarch or total arch replacement with MHCA or if SACP is better than RCP in longer circulatory arrest times. But, it does introduce a tool and a method to answer these questions with a clinical trial directly comparing the modes of cerebral protection. All surgeons who perform arch surgery eagerly await the results of such a study as it may determine the best strategy of cerebral protection.

This is the author's manuscript of the article published in final edited form as:

Corvera, J. S. (2019). Cerebral circulation during retrogarde cerebral perfusion: evaluation using laser speckle flowgraphy (Commentary). The Annals of Thoracic Surgery. https://doi.org/10.1016/j.athoracsur.2018.12.018

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